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STATUS OF EELGRASS (ZOSTERA MARINA) ON THE NORTH
ATLANTIC COAST, FEBRUARY 1938

By Clarence Cottam, Senior Biologist, in Charge Section of Food
Habits, Division of Wildlife Research

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INTRODUCTION

Since the almost complete disappearance of eelgrass (Zostera marina) along the Atlantic coast in 1931, the Biological Survey has attempted to observe the situation rather closely because of the effect this abrupt diminution has had on the food supply of waterfowl. A number of progress reports have been submitted, the most recent in January 1937 (7). 1/ Earlier reports (1, 2, 3, 4, 5, 6) treat, among other things, of eelgrass history, ecology, extent and effect of disappearance, past periods of scarcity, attempts at transplanting, and possible causes of the disease destroying the plant.

As to the causes of the disease, at present pathologists hold widely differing opinions. Some have maintained that Labyrinthula, a mycetozoan discovered by Charles E. Renn (8) in the diseased tissues of plants from the Atlantic coast, was the causative organism. The same organism has recently been found, however, in normal specimens of eelgrass from the west coast.

1/ Numbers underscored in parentheses refer to the Literature Cited, page 6.

At present it can only be said that the abrupt disappearance of eelgrass is one of the most interesting biological phenomena of recent times. In the apparent rapidity of spread and degree of destruction no comparable disease has been recorded in botanic history. In comparison, the rate of tree destruction by the chestnut blight was slow.

A characteristic noted, since the first onslaught of the wasting disease, is the repeated sporadic attempts of the plant to reestablish itself. Numerous small local growths have been reported; in all but a few areas, however, these have been short lived and, although apparently thriving for a time, have been suddenly and almost completely destroyed.

To interpret present conditions, it is well to remember that destruction of eelgrass generally seems to occur from late summer to midwinter, except possibly in the extreme southern part of the range, as in coastal North Carolina, where failure is most often in evidence from the middle of summer to early fall. New growths recorded early in the season, therefore, can hardly be considered indicative of recovery.

By way of review it may be well to point out that eelgrass is a submerged pondweed (Naidaceae) growing on tidal mud flats and estuaries along the coast in water from the mean low tide level to a depth of 10 feet or more at low tide. Its range on the Atlantic coast is from Bogue Sound and New River in southern North Carolina to southern Labrador, with outlying more northerly stations in James Bay and southern Greenland. The same species likewise occurs on the European coast from the Mediterranean Sea to northern Scandinavia. This species with a number of varieties is found also on both the American and the Asiatic sides of the Pacific. It is significant that the plant is still unaffected in Pacific waters, while on both the American and the European sides of the Atlantic most of the eelgrass beds have been practically denuded since 1931.

Preserved specimens of eelgrass group nicely on the basis of size into fairly distinct regional varieties. Further study shows that each region so indicated comprises a more or less definite coastal unit having quite similar ecological conditions. Preliminary study of older specimens in the Gray Herbarium at Cambridge tends to justify this division of the range of Zostera into ecological units.

PRESENT CONDITIONS

New England and the Atlantic Coast of Canada

Because habitat conditions along the Atlantic coast differ greatly in topography of coastline, character of soil, range of tide, temperature, and turbidity of water, it is not surprising that the eelgrass differs greatly in size and general appearance. Plants along the coast of Maine

may have leaves more than 2 yards long and half an inch wide. From Maine southward, the plant shows an irregular but definite reduction in size, until in the southern extent of the range (southern North Carolina) the leaves are often only 5 to 8 inches long and proportionately narrow.

Extremely variable stages in the degree of eelgrass recovery seem to exist along the coast of New England and southern Canada, even where conditions appear to be similar in regard to salinity, soil, and water depths.

Harrison F. Lewis, chief Federal migratory bird officer of Ontario and Quebec, wrote on October 20, 1937, that from personal observation he could see no material improvement in the condition of eelgrass on the north shore of the Gulf of St. Lawrence from Mingan to Blanc Sablon or at several places visited in Yarmouth County, N. S. He stated, however, that some increase and improvement in the local growth at Port Joli, N. S., was reported by local observers. At Isle Verte he found no improvement, and local observers told him that during the year the plant had been considerably reduced.

Dr. Lewis added that a commercial firm at Halifax, N. S., which uses eelgrass for manufacturing purposes, reports an improved growth and a considerable harvest of the plant this year at St. Margaret Bay, west of Halifax, and at Cole Harbor, east of that city.

Conditions along the coast of Maine likewise seem quite variable, although somewhat more encouraging than along the Canadian coast. Regional Director Bertrand E. Smith reported on January 21, 1938, that the whole situation along the New England coast and particularly in Maine "is generally improved." He stated that large beds of eelgrass are now found on the north end of Chebeague and Cousin Islands and that some of the plants have leaves 4 to 5 feet long. He also reported great improvement at the mouth of Broad Cove, Casco Bay. The beds around Lanes Island, however, did not show much change.

Junior Biologist Richard Griffith found a scant quantity of drifting eelgrass near South Lubec, Maine, on January 24, 1938, and obtained evidence of some growth near Jonesboro and Englishman Bay.

From the writer's observation and from reports of local observers and Messrs. Smith and Griffith and Game Management Agent Lee F. Brackett, it is apparent that a marked improvement has occurred in Great Bay, N.H. Though some disease was in evidence early in winter, that bay now has extensive beds of relatively healthy plants.

Brackett wrote that while Cape Cod, Mass., has relatively little eelgrass, in comparison with former years when conditions were normal, the "few beds that are left are doing well," and show "less evidence of disease."

Griffith found eelgrass on Castle Neck Beach and Ipswich Bay, Mass. Small stands of fairly healthy plants also were noted in the clam beds in Plymouth Harbor late in September. Similar stands

well scattered along coastal Cape Cod give evidence of a gradual improvement. A number of plots were noted by Griffith at Great Pond, Katama Bay, Eel Pond, Cape Poge Bay, Edgartown Harbor, and other areas on Marthas Vineyard. He wrote that all plants examined appeared to be healthy and differed in length as much as 25 inches. On February 3, 1938, he found drift on the shores of Chilmark and Black Point Ponds, Marthas Vineyard, with "grass" 10 to 36 inches long. These "grasses" and their rootstocks appeared healthy. He also reported that the plant appeared to be increasing in the Nantucket area.

Early in October, Griffith noted a 150-acre bed of eelgrass in the narrows of Pattaquamscott River, R.I., which, except for a few individual plants, appeared to be in excellent condition. He added that this bed had borne a "heavy crop" of seed earlier in the season. It must have survived more than 3 years. The size of the bed seems to be increasing. While good growths of the plant were noted at Watch Hill Beach and on Nimigret and Quenochontaug Ponds, little or no improvement is reported for the Point Judith area.

Long Island

The eelgrass situation has improved in a number of areas on coastal Long Island. Late in November, an excellent growth still remained at Shinnecock Bay, where a flock of some 50 brant were wintering. The beds near Fire Island Beach have increased in extent, and they appeared healthy on the last of December. A few scattered beds also were noted by Griffith in Moriches Bay, where the plant was practically nonexistent for 4 or 5 years.

In general, practically all observers reporting on the eelgrass situation on coastal New York and New England, including many fishermen, sportsmen, and clambers, agree that the plant is slowly but surely returning to its normal state.

New Jersey and the Delmarva Peninsula

Unfortunately, the eelgrass along the New Jersey coast, while probably in a little better condition than a year ago, is still sparse except in a few localities. A slight improvement seems to have occurred in parts of Barnegat Bay, but the more open bodies of water are still practically denuded. Nearly all the more open bays in coastal Delaware, Maryland, and the Eastern Shore of Virginia are also nearly bare. Small scattered plots of plants have been reported in Chincoteague and Sinepuxent Bays.

In nearly all areas of Chesapeake Bay where soil, water depth, and the saline content are suitable for eelgrass, a most encouraging improvement is seen, although in sections of higher salinity the plant shows considerable evidence of disease and is more scattered. Substantial drifts, characteristic of former years, now occur on the beaches from Pungoteague Creek, Va., northward. Both the drift and green plant material are gathered to serve as packing in the shipment of sea foods.

North Carolina

While the extent of eelgrass in coastal North Carolina is still small, a noticeable improvement has occurred there. Considerable drift may be noted occasionally, and specimens of plants from the numerous scattered beds, although often giving some evidence of the black streaking so characteristic of the "wasting disease," show a relatively healthy condition. Small beds of eelgrass were noted late in January by the writer and other observers in Pamlico Sound, near Rodanthe, Buxton, Hatteras, Ocracoke, Portsmouth, and Swanquarter, and at the mouth of a number of fresh-water streams emptying into Core Sound. A small quantity of drift was seen on Bogue Sound, indicating that conditions in this area are probably the same as a year ago. The plant is now known to occur south of New River in southern North Carolina.

Summary of Conditions

Even though eelgrass now exists only in small quantities in most of the bays and estuaries along the Atlantic coast, it is gratifying to report that, considering the area as a whole, conditions are much better than they have been at any time since the widespread disease first appeared. Some extensive areas where this important waterfowl food once flourished, however, are still practically barren. A few localities, particularly Chesapeake Bay and other waters of reduced salinity, have shown progressive improvement for several years. Growths in more saline situations have improved similarly for more than a year. A few areas, notably a large part of Chesapeake Bay in Maryland and northern Virginia and Shinnecock Bay, L. I., are now almost normal. In many smaller areas, particularly at the mouths of rivers and upstream to places where the salinity is about one-third that of normal sea water, this submerged plant is again flourishing. Some localities have not improved, and a few are probably in a worse condition than a year ago.

It is not known whether a more resistant strain of Atlantic Zostera is developing or whether the factor responsible for the decline of the plant along the Atlantic coast is becoming less virulent or is disappearing.

EXPERIMENTAL PLANTINGS

East Coast Variety

Because the eelgrass was almost extirpated from much of the Atlantic coast and because it is important to bird life, fishes, and shellfishes, the Bureau deemed it advisable to conduct planting experiments to see whether the species could be reestablished. Accordingly, in October 1935 and in April and May 1936 many plantings were made from Chesapeake Bay to the more open bays of coastal Maryland and Virginia and from Mecox Bay to South Oyster Bay, on Long Island. Unfortunately all these promptly died.

West Coast Variety

Inasmuch as the west coast variety of Zostera is also of great importance to wild fowl, fishes, and shellfishes, and has thus far escaped the blight, it was hoped that it could be transplanted and established in denuded areas along the Atlantic. Accordingly, several bushels of plants with rhizomes and about 1 quart of seed were shipped from Friday Harbor, Wash., in October 1935. In April 1936, additional material was obtained from Monterey Bay, Calif. Plantings were made in 11 plots from Cape Cod, Mass., to Cape Romain, S. C. (7). Some of these plantings succeeded for a time, but only three plants from Plymouth Harbor developed to the flowering state. Because of shipping delays, some seeds had begun to ferment, and their viability of course was reduced. Further, some rhizomes were probably so dried out that they could not recover after planting.

Encouraged, however, by the fact that a few plants survived, the Bureau decided to attempt plantings on a larger scale. Accordingly some 200 pounds of rhizomes were obtained from Monterey Bay, Calif., in April 1937 and planted in many places from eastern Casco Bay, Maine, to Cape Romain, S. C. As had been expected, all plants placed in the warmer water of the South promptly died. Some in New Jersey and New England survived a few months, but by December the only plants known to be still alive were in two small plots near Portland, Maine. Some plots later were destroyed by exposure at low tide, others by clammers, still others were in soil that was altogether too sandy, and at least one plot was later buried by silt following a torrential rain.

From these experiences, it may be concluded that the west coast variety of eelgrass cannot survive if transplanted in water noticeably warmer than that on the Pacific. Better success should result from the shipment of seeds in cold storage for planting in bays where water temperature, salinity, and other physical and chemical conditions closely parallel those of the west coast. Further experiments of this type will probably be conducted.

Whether the western variety of eelgrass is immune to the blight that has been so devastating to the Atlantic Zostera is not definitely known. Opportunities for the disease to reach the western coast must have occurred, however, in connection with the numerous transplantings of Atlantic oysters in the Pacific and the frequent exchange of water as ballast for ships. Regardless of these hazards, the eelgrass of the west coast seems to be normal in every respect.

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